

Solicitation #AG-84N8-S-12-0113 - Appendix #1

USDA FOREST SERVICE, R-4
YELLOWSTONE ADMINISTRATION SITE ELECTRICAL SYSTEM
SECTION 260500 - COMMON WORK RESULTS FOR ELECTRICAL

PART 1 - GENERAL

1.1 SUMMARY

- A. Section Includes:
 - 1. Electrical equipment installation.
 - 2. Common electrical installation requirements.

1.2 SUBMITTALS

- A. Product Data:
 - 1. For any substitutions for equipment referred to by name.

1.3 QUALITY ASSURANCE

- A. The installation shall conform to the 2011 Edition of the National Electrical Code (NFPA 70) and to the requirements specified herein.
- B. The Contractor shall perform all work necessary and required to accomplish the task as detailed on the drawings and discussed in the installation notes. All work shall be done by a state licensed electrician.

1.4 MEASUREMENT AND PAYMENT

- A. The work in this section, including all telecommunications wiring and incidentals in other electrical sections, shall be measured and paid for by the following method as shown in the Schedule of Items:
 - 1. Electrical System - Lump Sum including full compensation for all labor, materials, and incidentals necessary to complete the work as shown on the drawings including all wiring, trenching, bedding, backfill, and all other incidentals necessary for a functional system as shown on the drawings.

PART 2 - PRODUCTS

2.1 PRODUCTS REFERRED TO BY NAME

- A. The materials referred to by trade name, make, or catalog number on the drawings shall be regarded as establishing a minimum standard of quality; substitutions of equal or

greater quality can be made by submitting a data sheet of the proposed substituted item to the Contracting Officer, for approval.

PART 3 - EXECUTION

3.1 COMMON REQUIREMENTS FOR ELECTRICAL INSTALLATION

- A. Comply with NECA 1.
- B. Equipment: Install to facilitate service, maintenance, and repair or replacement of components of both electrical equipment and other nearby installations. Connect in such a way as to facilitate future disconnecting with minimum interference with other items in the vicinity.

3.2 ELECTRICAL PENETRATIONS

- A. Aboveground, Exterior-Wall Penetrations: Seal exterior opening around the raceway or sleeve or left by removal of equipment, using a flexible, waterproofing, joint sealant appropriate for size, depth, and color to closely match the surrounding surface. Finish interior openings, filling opening and matching the existing surface with appropriate materials and finish quality for the space.

END OF SECTION 260500

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SECTION 260519 - LOW-VOLTAGE ELECTRICAL POWER CONDUCTORS AND CABLES

PART 1 - GENERAL

1.1 SUMMARY

A. This Section includes the following:

1. Building wires and cables rated 600 V and less.
2. Connectors, splices, and terminations rated 600 V and less.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.3 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 CONDUCTORS AND CABLES

- A. Copper Conductors: Comply with NEMA WC 70.
- B. Conductor Insulation: Comply with NEMA WC 70 for Types THHN-THWN.
- C. Multiconductor Cable: Comply with NEMA WC 70 for nonmetallic-sheathed cable, Type NM and UF with ground wire.
- D. Insulation shall be "Sunlight Resistant" where exposed to direct sunlight.

2.2 CONNECTORS AND SPLICES

- A. Description: Factory-fabricated connectors and splices of size, ampacity rating, material, type, and class for application and service indicated.

PART 3 - EXECUTION

3.1 CONDUCTOR MATERIAL APPLICATIONS

- A. Typical: Solid for No. 10 AWG and smaller; stranded for No. 8 AWG and larger.
- B. Control Wiring: Solid or stranded for No. 10 AWG and smaller.

3.2 CONDUCTOR INSULATION AND MULTICONDUCTOR CABLE APPLICATIONS AND WIRING METHODS

- A. Service Entrance: Type THHN-THWN, single conductors in raceway.
- B. Feeders: Type THHN-THWN, single conductors in raceway, or underground feeder cable, Type UF in sleeves where exposed above grade where allowed in the drawings.
- C. Branch Circuits in Crawlspace: Nonmetallic-sheathed cable, Type NM.
- D. Branch Circuits Concealed in Ceilings, Walls, and Partitions: Nonmetallic-sheathed cable, Type NM.

3.3 INSTALLATION OF CONDUCTORS AND CABLES

- A. Conceal cables in finished walls, ceilings, and floors, unless otherwise indicated.
- B. Use manufacturer-approved pulling compound or lubricant where necessary; compound used must not deteriorate conductor or insulation. Do not exceed manufacturer's recommended maximum pulling tensions and sidewall pressure values.
- C. Use pulling means, including fish tape, cable, rope, and basket-weave wire/cable grips, that will not damage cables or raceway.
- D. Install exposed cables parallel and perpendicular to surfaces of exposed structural members, and follow surface contours where possible.

3.4 CONNECTIONS

- A. Tighten electrical connectors and terminals according to manufacturer's published torque-tightening values. If manufacturer's torque values are not indicated, use those specified in UL 486A and UL 486B.
- B. Make splices and taps that are compatible with conductor material and that possess equivalent or better mechanical strength and insulation ratings than unspliced conductors.
- C. Wiring at Outlets: Install conductor at each outlet, with at least **6 inches (150 mm)** of slack.

3.5 FIELD QUALITY CONTROL

- A. Remove and replace malfunctioning or damaged units.

END OF SECTION 260519

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SECTION 260526 - GROUNDING AND BONDING FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes methods and materials for grounding systems and equipment.

1.2 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, by a qualified testing agency, and marked for intended location and application.
- B. Comply with UL 467 for grounding and bonding materials and equipment.

1.3 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 CONDUCTORS

- A. Insulated Conductors: Copper wire or cable insulated for 600 V unless otherwise required by applicable Code or authorities having jurisdiction.
- B. Bare Copper Conductors:
 - 1. Solid Conductors: ASTM B 3.
 - 2. Stranded Conductors: ASTM B 8.

2.2 CONNECTORS

- A. Listed and labeled by a nationally recognized testing laboratory acceptable to authorities having jurisdiction for applications in which used, and for specific types, sizes, and combinations of conductors and other items connected.
- B. Bolted Connectors for Conductors and Pipes: Copper or copper alloy, bolted pressure-type, with at least two bolts.
 - 1. Pipe Connectors: Clamp type, sized for pipe.

2.3 GROUNDING ELECTRODES

- A. Ground Rods: Copper-clad steel; 3/4 inch by 10 feet (19 mm by 3 m) in diameter.

PART 3 - EXECUTION

3.1 APPLICATIONS

- A. Conductors: Install solid conductor for No. 8 AWG and smaller, and stranded conductors for No. 6 AWG and larger, unless otherwise indicated.
- B. Underground Grounding Conductors: Install bare copper conductor, No. as sized on the drawings minimum.
 - 1. Bury at least **24 inches (600 mm)** below grade.

3.2 EQUIPMENT GROUNDING

- A. Install insulated equipment grounding conductors with all feeders and branch circuits. Where not otherwise shown in the drawings size per NEC 250.122 minimum.

3.3 INSTALLATION

- A. Grounding Conductors: Route along shortest and straightest paths possible, unless otherwise indicated or required by Code. Avoid obstructing access or placing conductors where they may be subjected to strain, impact, or damage.
- B. Ground Rods: Drive rods until tops are **2 inches (50 mm)** below finished floor or final grade, unless otherwise indicated.
 - 1. Interconnect ground rods with grounding electrode conductor below grade and as otherwise indicated. Make connections without exposing steel or damaging coating, if any.
 - 2. For the service grounding electrode system, install at least two rods spaced at least one-rod length from each other and located at least the same distance from other grounding electrodes, and connect to the service grounding electrode conductor.
- C. Grounding and Bonding for Piping:
 - 1. Metal Water Service Pipe: Install copper grounding conductors from building's main service equipment, or grounding bus, to main metal water service entrances to building. Connect grounding conductors to main metal water service pipes, using a bolted clamp connector. Where a dielectric main water fitting is installed, connect grounding conductor on street side of fitting and bond across the fitting.

END OF SECTION 260526

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SECTION 260533 - RACEWAY AND BOXES FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes raceways, fittings, boxes, enclosures, and cabinets for electrical wiring.

1.2 DEFINITIONS

- A. IMC: Intermediate metal conduit.
- B. RNC: Rigid nonmetallic conduit.

1.3 QUALITY ASSURANCE

- A. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- B. Comply with NFPA 70.

1.4 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 METAL CONDUIT

- A. Rigid Steel Conduit: ANSI C80.1.
- B. IMC: ANSI C80.6.
- C. Fittings for Conduit: NEMA FB 1; listed for type and size raceway with which used, and for application and environment in which installed.

2.2 NONMETALLIC CONDUIT

- A. RNC: NEMA TC 2, Type EPC-40-PVC, unless otherwise indicated.
- B. Fittings for RNC: NEMA TC 3; match to conduit and material.

2.3 BOXES, ENCLOSURES, AND CABINETS

- A. Sheet Metal Outlet and Device Boxes: NEMA OS 1.
- B. Cast-Metal Outlet and Device Boxes: NEMA FB 1, Type FD, with gasketed cover.
- C. Nonmetallic Outlet and Device Boxes: NEMA OS 2.
- D. Small Sheet Metal Pull and Junction Boxes: NEMA OS 1.

PART 3 - EXECUTION

3.1 RACEWAY APPLICATION

- A. Outdoors: Apply raceway products as specified below, unless otherwise indicated:
 - 1. Conduit: Rigid steel conduit or IMC.
 - 2. Underground Conduit: Rigid steel conduit or IMC is required for the first **5-ft (1.5-m)** beyond grade penetration at which point RNC, Type EPC-40-PVC, direct buried may be substituted. **24-inch (600-mm)** minimum burial depth unless otherwise indicated on the drawings.
 - 3. Boxes and Enclosures, Aboveground: NEMA 250, Type 3R.
- B. Comply with the following indoor applications, unless otherwise indicated:
 - 1. Concealed in Ceilings and Interior Walls and Partitions: RNC or Cable.
 - 2. Boxes and Enclosures: NEMA 250, Type 1.
- C. Raceway Fittings: Compatible with raceways and suitable for use and location.
 - 1. Rigid and Intermediate Steel Conduit: Use threaded rigid steel conduit fittings, unless otherwise indicated.

3.2 INSTALLATION

- A. Comply with NECA 1 for installation requirements applicable to products specified in Part 2 except where requirements on Drawings or in this Article are stricter.
- B. Complete raceway installation before starting conductor installation.
- C. Arrange stub-ups so curved portions of bends are not visible above grade.
- D. Conceal conduit within finished walls, ceilings, and floors, unless otherwise indicated.

3.3 INSTALLATION OF UNDERGROUND CONDUIT

- A. Direct-Buried Conduit:
 - 1. Excavate trench bottom to provide firm and uniform support for conduit.
 - 2. Backfill material within 4" of the conduit shall be **3/4 inch (20 mm)** minus soil or sand based material. Backfill in the remainder of the trench shall be free of rocks larger than **4 inches (100 mm)** in diameter.
 - 3. After installing conduit, backfill and compact. Start at tie-in point, and work toward end of conduit run, leaving conduit at end of run free to move with

expansion and contraction as temperature changes during this process. Firmly hand tamp backfill around conduit to provide maximum supporting strength. After placing controlled backfill to within **12 inches (300 mm)** of finished grade, make final conduit connection at end of run and complete backfilling with normal compaction.

4. Install with a maximum of four 90-degree bends or equivalent for each length of raceway and a maximum of **250 feet (75 m)** wire length, or, with a maximum of two 90-degree bends or equivalent for each length of raceway and a maximum of **500 feet (150 m)** wire length unless drawings show stricter requirements.
5. Underground-Line Warning Tape: Install according to specification 260553-Identification for Electrical Systems.

3.4 PROTECTION

- A. Provide final protection and maintain conditions that ensure coatings, finishes, and cabinets are without damage or deterioration at time of Substantial Completion.
 1. Repair damage to galvanized finishes with zinc-rich paint recommended by manufacturer.

END OF SECTION 260533

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SECTION 260553 - IDENTIFICATION FOR ELECTRICAL SYSTEMS

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
1. Underground-line warning tape.
 2. Warning labels and signs.

1.2 QUALITY ASSURANCE

- A. Comply with NFPA 70.
B. Comply with 29 CFR 1910.145.

1.3 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 UNDERGROUND-LINE WARNING TAPE

- A. Description: Permanent, bright-colored, continuous-printed, polyethylene tape.
1. Not less than 3 inches (75 mm) wide by 4 mils (0.102 mm) thick.
 2. Compounded for permanent direct-burial service.
 3. Printed legend shall indicate type of underground line.

2.2 WARNING LABELS AND SIGNS

- A. Comply with NFPA 70 and 29 CFR 1910.145.
B. Self-Adhesive Warning Labels: Factory printed, multicolor, pressure-sensitive adhesive labels, configured for display on front cover, door, or other access to equipment, unless otherwise indicated.
C. Warning label and sign shall include, but are not limited to, the following legends:
1. Flash Protection Warning: Minimum of "WARNING – ARC FLASH HAZARD."

PART 3 - EXECUTION

3.1 APPLICATION

- A. Locations of Underground Lines: Identify with underground-line warning tape for power, lighting, communication, and control wiring and optical fiber cable. Install underground-line warning tape for both direct-buried cables and cables in raceway.
- B. Warning Labels for Indoor Cabinets, Boxes, and Enclosures for Power and Lighting: Comply with 29 CFR 1910.145 and apply self-adhesive warning labels or baked-enamel warning signs. Apply to exterior of door, cover, or other access.

3.2 INSTALLATION

- A. Location: Install identification materials and devices at locations for most convenient viewing without interference with operation and maintenance of equipment.
- B. Self-Adhesive Identification Products: Clean surfaces before application, using materials and methods recommended by manufacturer of identification device.
- C. Underground-Line Warning Tape: During backfilling of trenches install continuous underground-line warning tape directly above line at **6 to 8 inches (150 to 200 mm)** below finished grade. Use multiple tapes where width of multiple lines installed in a common trench exceeds **16 inches (400 mm)** overall.

END OF SECTION 260553

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SECTION 262726 - WIRING DEVICES

PART 1 - GENERAL

1.1 SUMMARY

- A. This Section includes the following:
 - 1. Receptacles, receptacles with integral GFCI, and associated device plates.
 - 2. Snap switches.

1.2 DEFINITIONS

- A. GFCI: Ground-fault circuit interrupter.
- B. Pigtail: Short lead used to connect a device to a branch-circuit conductor.

1.3 QUALITY ASSURANCE

- A. Source Limitations: Obtain each type of wiring device and associated wall plate through one source from a single manufacturer. Insofar as they are available, obtain all wiring devices and associated wall plates from a single manufacturer and one source.
- B. Electrical Components, Devices, and Accessories: Listed and labeled as defined in NFPA 70, Article 100, by a testing agency acceptable to authorities having jurisdiction, and marked for intended use.
- C. Comply with NFPA 70.

1.4 MEASUREMENT AND PAYMENT

- A. No separate measurement or payment will be made for work specified in this section. All work will be included in other items listed in the Schedule of Items.

PART 2 - PRODUCTS

2.1 MANUFACTURERS

- A. Manufacturers' Names: Shortened versions (shown in parentheses) of the following manufacturers' names are used in other Part 2 articles:
 - 1. Cooper Wiring Devices; a division of Cooper Industries, Inc. (Cooper).
 - 2. Hubbell Incorporated; Wiring Device-Kellems (Hubbell).
 - 3. Leviton Mfg. Company Inc. (Leviton).
 - 4. Pass & Seymour/Legrand; Wiring Devices & Accessories (Pass & Seymour or P&S).

5. Bryant Electric Incorporated, a division of Hubbell Incorporated (Bryant).

2.2 STRAIGHT BLADE RECEPTACLES

- A. Convenience Receptacles, 125 V, 15 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-15R, and UL 498.
1. See the attached Table for acceptable products and manufacturers. Types to be coordinated with the drawings. Submittals from manufacturers not shown of equal or better products will be considered.
- B. Tamper-Resistant Convenience Receptacles, 125 V, 15 A: Comply with NEMA WD 1, NEMA WD 6 configuration 5-20R, and UL 498.

2.3 GFCI RECEPTACLES

- A. General Description: Straight blade. Comply with NEMA WD 1, NEMA WD 6, UL 498, and UL 943, Class A, and include indicator light that is lighted when device is tripped.
- B. Duplex GFCI Convenience Receptacles, 125 V, 15 A: See the attached Table for acceptable products and manufacturers. Types to be coordinated with the drawings. Submittals from manufacturers not shown of equal or better products will be considered.

2.4 SNAP SWITCHES

- A. Comply with NEMA WD 1 and UL 20.
- B. Switches, 120/277 V, 15 A:
1. See the attached Table for acceptable products and manufacturers. Types to be coordinated with the drawings. Submittals from manufacturers not shown of equal or better products will be considered.

Device	Manufacturer				
	Bryant	Cooper	Hubbell	Leviton	** P&S
Receptacle, Duplex	-	BR15*	CR5262*	5262*	CRB5262*
Receptacle, TR		TRBR15*	BR15*TR	8200-SG*	TR5262*
Receptacle, GFCI	-	VGF15*	GF15L*	7599-HG*	1595*
Recept., TR WR GFCI		TWRVG15*	GFTR15*	-	1595TRWR*
Switch	CSB115B*	CSB115*	CS115*	CSB1-15*	CSB15AC1*
Switch, 3-Way	CSB315B*	CSB315*	CS315*	CSB3-15*	CSB15AC3*
Switch, Illuminated	4801GLI	CS120LTV	HBL1201IL	1201-LHI	PS15AC1ISL

* Color per specifications

** Pass & Seymour

2.5 WALL PLATES

- A. Single and combination types to match corresponding wiring devices.
 - 1. Plate-Securing Screws: Metal with head color to match plate finish.
 - 2. Material for Finished Spaces: Smooth, high-impact thermoplastic.
 - 3. Material for Unfinished Spaces: Galvanized steel.
- B. Wet-Location, Weatherproof Cover Plates: NEMA 250, complying with type 3R weather-resistant “extra-duty” thermoplastic with lockable cover.

2.6 FINISHES

- A. Color: Wiring device catalog numbers in Section Text do not designate device color.
 - 1. Wiring Devices Connected to Normal Power System: Ivory, unless otherwise indicated or required by NFPA 70 or device listing.

PART 3 - EXECUTION

3.1 INSTALLATION

- A. Comply with 2008 NEC 406.11 for tamper resistant receptacles in residential buildings, and 406.8 for weather resistant receptacles at new or replaced receptacles.
- B. Comply with NECA 1, including the mounting heights listed in that standard, unless otherwise noted.
- C. Coordination with Other Trades:
 - 1. Install wiring devices after all wall preparation, including painting, is complete.
- D. Conductors:
 - 1. Do not strip insulation from conductors until just before they are spliced or terminated on devices.
 - 2. Strip insulation evenly around the conductor using tools designed for the purpose. Avoid scoring or nicking of solid wire or cutting strands from stranded wire.
 - 3. The length of free conductors at outlets for devices shall meet provisions of NFPA 70, Article 300, without pigtails.
 - 4. Existing Conductors:
 - a. Cut back and pigtail, or replace all damaged conductors.
 - b. Straighten conductors that remain and remove corrosion and foreign matter.
 - c. Pigtailing existing conductors is permitted provided the outlet box is large enough.
- E. Device Installation:
 - 1. Keep each wiring device in its package or otherwise protected until it is time to connect conductors.

2. Do not remove surface protection, such as plastic film and smudge covers, until the last possible moment.
3. Connect devices to branch circuits using pigtails that are not less than **6 inches (152 mm)** in length.
4. When there is a choice, use side wiring with binding-head screw terminals. Wrap solid conductor tightly clockwise, 2/3 to 3/4 of the way around terminal screw.
5. Use a torque screwdriver when a torque is recommended or required by the manufacturer.
6. Tighten unused terminal screws on the device.
7. When mounting into metal boxes, remove the fiber or plastic washers used to hold device mounting screws in yokes, allowing metal-to-metal contact.
8. GFCI receptacles:
 - a. Shall be installed non-feed-through

F. Device Plates: Do not use oversized or extra-deep plates. Repair wall finishes and remount outlet boxes when standard device plates do not fit flush or do not cover rough wall opening.

END OF SECTION 262726

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